CLAIMS

1. A heat exchanger, comprising:

a pair of header tanks; and

a plurality of heat exchanging tubes disposed between said pair of header tanks and arranged in parallel in a header tank longitudinal direction,

wherein each of said header tanks is provided with one or more partitioning walls integrally formed in each of said header tanks and extended in the header tank longitudinal direction, whereby a plurality of tank portions divided by said one or more partitioning walls and extended in the header tank longitudinal direction are formed and arranged in parallel in a header tank widthwise direction, wherein a refrigerant turning communication aperture for communicating adjacent tank portions is formed in a prescribed partitioning wall,

wherein each of said heat exchanging tubes has a flat configuration having a width dimension larger than a height dimension, and is provided with a plurality of refrigerant passages extended in a tube longitudinal direction and arranged in parallel in a tube widthwise direction,

wherein both ends of each of said heat exchanging tubes are communicated with said pair of header tanks so that said refrigerant passages of each of said heat exchanging tubes are grouped in the tube widthwise direction in accordance with each tank portion of said header tanks, to thereby form a plurality of passes arranged in parallel in the tube widthwise direction, and

wherein refrigerant introduced into a first tank portion of one of said header tanks is introduced into a first tank portion of the other of said header tanks via a first pass, then the refrigerant is introduced into a second tank portion of the other of said header tanks via said refrigerant turning communication aperture, and thereafter the refrigerant is introduced into a second tank portion of said one of said header tanks via a second pass.

2. The heat exchanger as recited in claim 1, wherein each of said header tanks is an integrally formed article formed by extrusion processing or drawing processing.

3. The heat exchanger as recited in claim 1, wherein said heat exchanging tube is an integrally formed article formed by extrusion processing or drawing processing.

4. The heat exchanger as recited in claim 1, wherein a plurality of tube insertion apertures communicating with said tank portions are provided at an inner side surface of each of said header tanks at certain intervals in the header tank longitudinal direction, and wherein refrigerant passages at end portions of said heat exchanging tubes are communicated with corresponding tube insertion apertures.

5. The heat exchanger as recited in claim 4, wherein end portions of each of said heat exchanging tubes are provided with

one or more cutout portions corresponding to said one or more partitioning walls, and said end portions of each of said heat exchanging tubes are inserted into said tube insertion apertures with said one or more partitioning walls fitted in said one or more cutout portions.

6. The heat exchanger as recited in claim 5, wherein one or more regions of each of said heat exchanging tubes corresponding to said one or more cutout portions are formed to be one or more non-passage areas in which no refrigerant passage exists, and wherein regions of each of said heat exchanging tubes not corresponding to said one or more cutout portions are formed to be passage areas in which said refrigerant passages exist.

7. The heat exchanger as recited in claim 1, wherein said refrigerant turning communication aperture formed in said partitioning wall of the other of said header tanks is configured by a cut aperture formed in an inside surface of the other of said header tanks.

8. The heat exchanger as recited in claim 1, wherein each of said header tanks is provided with a joining plate joined to an inner side surface thereof, wherein a plurality of tube insertion apertures are provided in said joining plate at certain intervals in a joining plate longitudinal direction, and wherein end portions of each of said heat exchanging tubes are inserted into

corresponding tube insertion apertures to be communicated with said header tanks.

9. The heat exchanger as recited in claim 1, wherein CO_2 is used as the refrigerant.

10. A method for manufacturing a heat exchanger, comprising:

preparing a pair of header tanks, wherein each of said header tanks is provided with one or more partitioning walls integrally formed in each of said header tanks and extended in a header tank longitudinal direction, whereby a plurality of tank portions divided by said one or more partitioning walls and extended in the header tank longitudinal direction are formed so as to be arranged in parallel in a header tank widthwise direction, wherein a refrigerant turning communication aperture for communicating adjacent tank portions is formed in predetermined partitioning walls;

preparing a plurality of heat exchanging tubes, wherein each of said heat exchanging tubes has a flat configuration having a width dimension larger than a height dimension, and is provided with a plurality of refrigerant passages extended in a tube longitudinal direction and arranged in parallel in a tube widthwise direction; and

forming a plurality of passes arranged in parallel in the tube widthwise direction by communicating both ends of each of said heat exchanging tubes with said pair of header tanks so that said

refrigerant passages of each heat exchanging tubes are grouped into said plurality of passes in the tube widthwise direction in accordance with each of said tank portions of said header tank,

whereby refrigerant introduced into a first tank portion of one of said header tanks is introduced into a first tank portion of the other of said header tanks via a first pass, then the refrigerant is introduced into a second tank portion of the other of said header tanks via said refrigerant turning communication aperture, and thereafter the refrigerant is introduced into a second tank portion of said one of said header tanks via a second pass.

11. The method for manufacturing a heat exchanger as recited in claim 10, wherein at least one of said header tanks is provided, at its inner surface side, with a plurality of tube insertion apertures for communicating end portions of said heat exchanging tubes and said refrigerant turning communication aperture, and wherein said tube insertion apertures and said refrigerant turning communication aperture are formed simultaneously by cutting processing.

12. A heat exchanger, comprising:

a pair of header tanks; and

a plurality of heat exchanging tubes disposed between said pair of header tanks and arranged in a header tank longitudinal direction,

wherein each of said header tanks is provided with three

partitioning walls integrally formed in each of header tanks and extended in the header tank longitudinal direction, whereby a first tank portion to a fourth tank portion divided by said partitioning walls and extended in the header tank longitudinal direction are formed so as to be arranged in parallel in a header tank widthwise direction, wherein a refrigerant turning communication aperture for communicating adjacent tank portions is formed in a partitioning wall partitioning the second tank portion and the third tank portion of said one of said header tanks, a partitioning wall partitioning the first tank portion and the second tank portion of the other of said header tanks and a partitioning wall partitioning the third tank portion and the fourth tank portion of the other of said header tanks,

wherein each of said heat exchanging tubes has a flat configuration having a width dimension larger than a height dimension, and is provided with a plurality of refrigerant passages extended in a tube longitudinal direction and arranged in parallel in a tube widthwise direction,

wherein both ends of each of said heat exchanging tubes are communicated with said pair of header tanks so that said refrigerant passages of each of said heat exchanging tubes are grouped in the tube widthwise direction in accordance with each tank portion of said header tanks, to thereby form a first to fourth passes arranged in parallel in the tube widthwise direction, and

wherein refrigerant introduced into the first tank portion of one of said header tanks passes through the first to fourth passes

in turn and then introduced into the fourth tank portion of said one of said header tanks.

13. A tube connecting structure for a header tank of a heat exchanger comprising a pair of header tanks and a plurality of heat exchanging tubes disposed between said pair of header tanks and arranged in a header tank longitudinal direction,

wherein each of said header tanks is provided with one or more partitioning walls integrally formed in each of header tanks and extended in the header tank longitudinal direction, whereby a plurality of tank portions divided by said partitioning walls and extended in the header tank longitudinal direction are formed so as to be arranged in parallel in a header tank widthwise direction, wherein tube insertion apertures communicating with said tank portions are formed in one side surface of each of said header tanks,

wherein each of said heat exchanging tubes has a flat configuration having a width dimension larger than a height dimension, and is provided with a plurality of refrigerant passages extending in a tube longitudinal direction and arranged in parallel in a tube widthwise direction,

wherein both ends of each of said heat exchanging tubes are communicated with said pair of header tanks so that said refrigerant passages of each of said heat exchanging tubes are grouped in the tube widthwise direction in accordance with each tank portion of said header tanks, to thereby form a plurality of passes arranged in parallel in the tube widthwise direction, and

wherein refrigerant passes through each of said grouped refrigerant passages independently.

14. The tube connecting structure as recited in claim 13, wherein end portions of said heat exchanging tubes are provided with one or more cutout portions corresponding to said one or more partitioning walls, and said end portions of said heat exchanging tubes are inserted into said tube insertion apertures with said one or more partitioning walls fitted in said one or more cutout portions.

15. The tube connecting structure as recited in claim 14, wherein one or more regions of each of said heat exchanging tubes corresponding to said one or more cutout portions are formed to be one or more non-passage areas in which no refrigerant passage exists, and wherein regions of each of said heat exchanging tubes not corresponding to said one or more cutout portions are formed to be passage areas in which said refrigerant passages exist.

16. A refrigerant system having a refrigeration cycle in which refrigerant compressed by a compressor is cooled by a gas cooler, decompressed by a decompressor, then heated while passing through a cooling device and then returned to said compressor,

wherein said gas cooler is configured by a heat exchanger comprising a pair of header tanks and a plurality of heat exchanging tubes disposed between said pair of header tanks and arranged in

a header tank longitudinal direction,

wherein each of said header tanks is provided with one or more partitioning walls integrally formed in each of said header tanks and extended in the header tank longitudinal direction, whereby a plurality of tank portions divided by said one or more partitioning walls and extended in the header tank longitudinal direction are formed so as to be arranged in parallel in a header tank widthwise direction, wherein a refrigerant turning communication aperture for communicating adjacent tank portions is formed in a prescribed partitioning wall,

wherein each of said heat exchanging tubes has a flat configuration having a width dimension larger than a height dimension, and is provided with a plurality of refrigerant passages extended in a tube longitudinal direction and arranged in parallel in a tube widthwise direction,

wherein both ends of each of said heat exchanging tubes are communicated with said pair of header tanks so that said refrigerant passages of each of said heat exchanging tubes are grouped in the tube widthwise direction in accordance with each tank portion of said header tanks, to thereby form a plurality of passes arranged in parallel in the tube widthwise direction, and

wherein refrigerant introduced into a first tank portion of one of said header tanks is introduced into a first tank portion of the other of said header tanks via a first pass, then the refrigerant is introduced into a second tank portion of the other of said header tanks via said refrigerant turning communication

aperture, and thereafter the refrigerant is introduced into a second tank portion of said one of said header tanks via a second pass.

17. The refrigerant system as recited in claim 16, wherein CO_2 is used as the refrigerant.

18. A gas cooler using supercritical refrigerant in which a plurality of heat exchanging tubes are disposed between a pair of header tanks and arranged in parallel in a header tank longitudinal direction,

wherein each of said header tanks is provided with one or more partitioning walls integrally formed in each of said header tanks and extended in the header tank longitudinal direction, whereby a plurality of tank portions divided by said one or more partitioning walls and extended in the header tank longitudinal direction are formed so as to be arranged in parallel in a header tank widthwise direction, wherein a refrigerant turning communication aperture for communicating adjacent tank portions is formed in a prescribed partitioning wall,

wherein each of said heat exchanging tubes has a flat configuration having a width dimension larger than a height dimension, and is provided with a plurality of refrigerant passages extended in a tube longitudinal direction and arranged in parallel in a tube widthwise direction,

wherein both ends of each of said heat exchanging tubes are communicated with said pair of header tanks so that said refrigerant

passages of each of said heat exchanging tubes are grouped in the tube widthwise direction in accordance with each tank portion of said header tanks, to thereby form a plurality of passes arranged in parallel in the tube widthwise direction,

wherein refrigerant introduced into a first tank portion of one of said header tanks is introduced into a first tank portion of the other of said header tanks via a first pass, then the refrigerant is introduced into a second tank portion of the other of said header tanks via said refrigerant turning communication aperture, and thereafter the refrigerant is introduced into a second tank portion of said one of said header tanks via a second pass, and

wherein the refrigerant passing through the first and second passes is cooled by exchanging heat with ambient air.

19. The gas cooler using supercritical refrigerant as recited in claim 18, wherein CO_2 is used as the refrigerant.